

**POWER SYSTEM CHECKLIST**

Safety Components System for a Caterpillar Model 3306 PCNA Engine

Listed below are the items and functions that must be maintained in order for the power system to be considered permissible. For a complete equipment permissibility evaluation, this checklist must be used in conjunction with a machine checklist and, if so equipped, an electrical system checklist.

ALL INSPECTIONS AND TESTS SHALL BE PERFORMED IN FRESH AIR.

APPLICABLE APPROVALS
31-107-0
31-107-1
31-107-2
31-130-0
31-130-1

Drawing No. 8 3 2 A - 1 0

Revision No. A, B, C

Date 9/17/87

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1. ( ) It has been determined that the area in which the tests are to be performed in fresh air.
2. ( ) This machine utilizes a Caterpillar six cylinder model 3306 PCNA diesel engine, as shown in Figure 1.

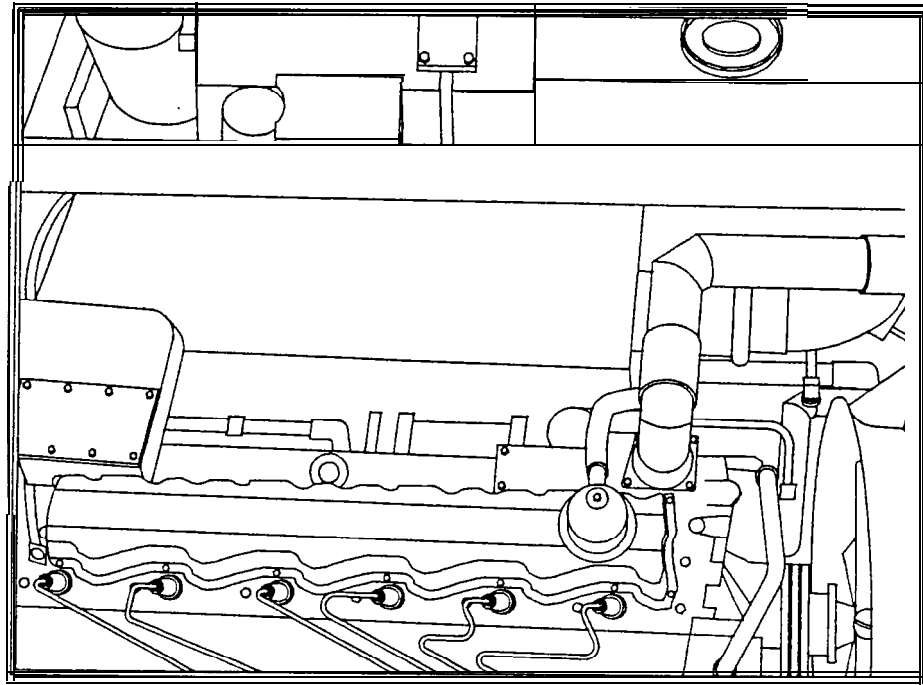


Figure. No. 1: Caterpillar Model 3306 PCNA Engine

## Intake System

Figure 2 and Figure 3 depict the assembled intake system.

(WEEKLY) 3. ( ) All components appear to be the same as shown in the figures.

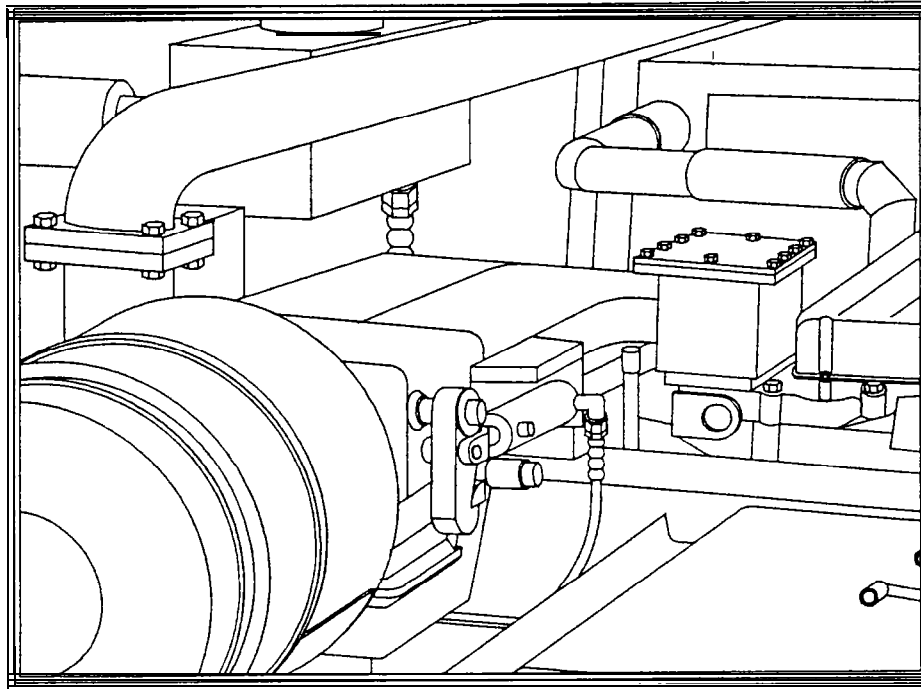


Figure No. 2: Assembled Intake System

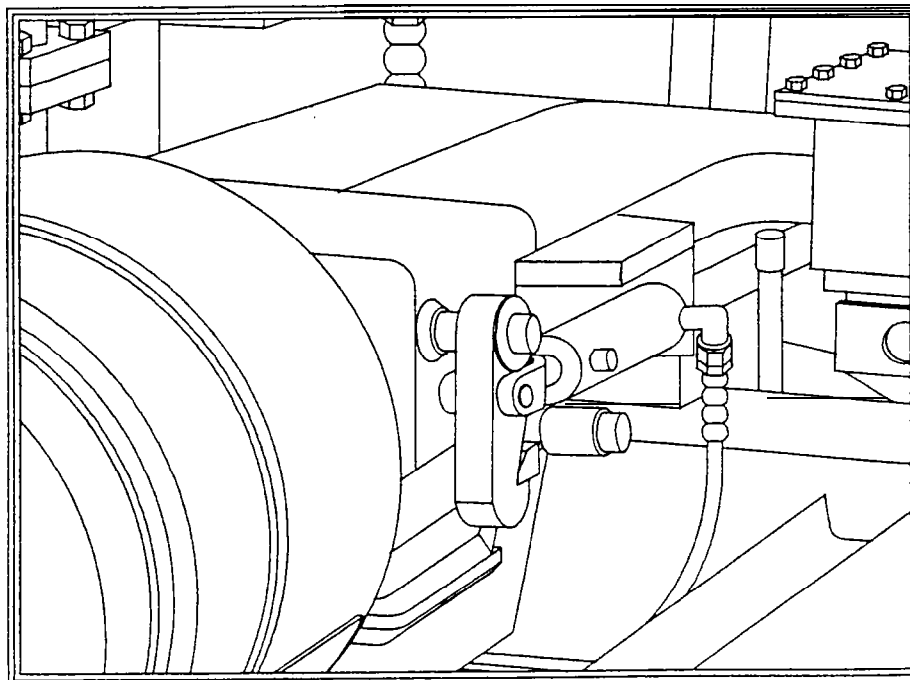


Figure No. 3: Assembled Intake System

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(WEEKLY) - DESIGNATES THOSE INSPECTION CHECKS THAT MUST BE PERFORMED DURING THE WEEKLY MAINTENANCE EXAMINATION IN ACCORDANCE WITH 30 CFR, SECTION 75.1914.

- (WEEKLY)
- ( ) A copper gasket is installed between the lower intake housing and the engine head (as shown in Figure 4).
  - ( ) Remove the cover plate from the lower intake housing. The four (4) bolts and lockwashers securing this housing to the engine head are in place and tight.
  - ( ) A copper gasket is installed between the lower intake housing and its top cover plate. The location of this gasket is shown in Figure 5.
  - ( ) Reinstall the cover plate to the lower intake housing. The bolts and lockwashers are in place and tight (Figure 5).

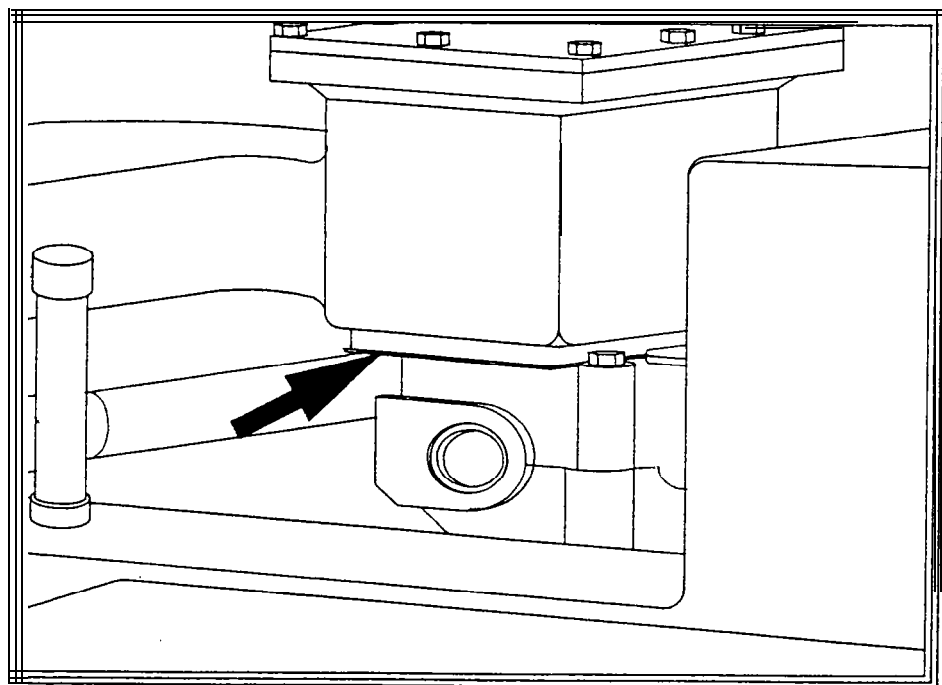


Figure No. 4: Gasket Between Lower Intake Housing and Engine Head

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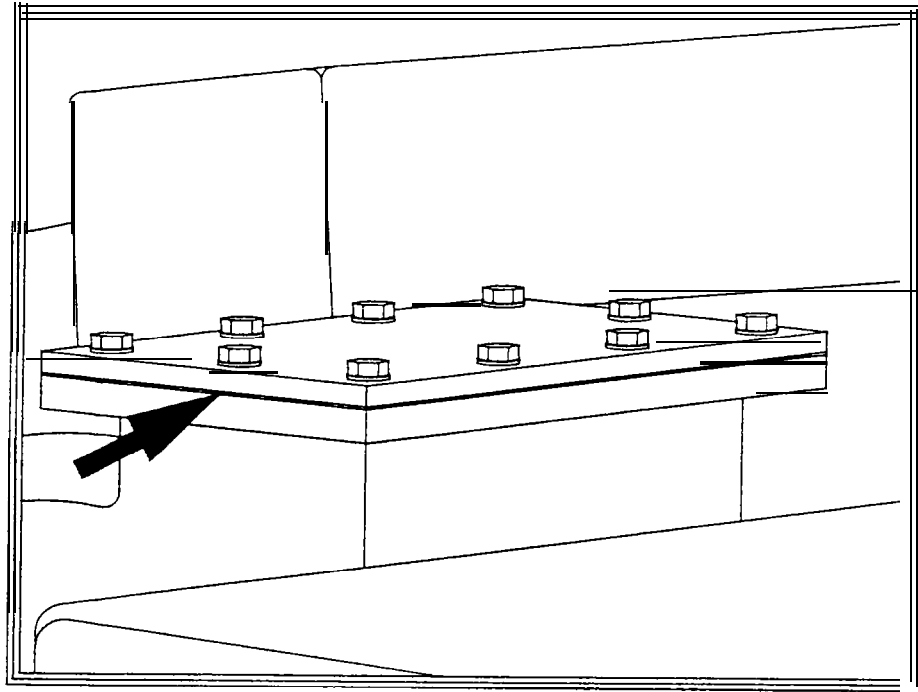


Figure. No. 5: Gasket Between Cover Plate  
and Lower Intake Housing;  
Bolts and Lockwashers on  
Cover Plate

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- (WEEKLY) 8. ( ) A copper gasket is installed between the alternate (unused) intake cover plate and the engine head (as shown in Figure 6). The four (4) bolts and washers securing the cover plate are in place and tight.

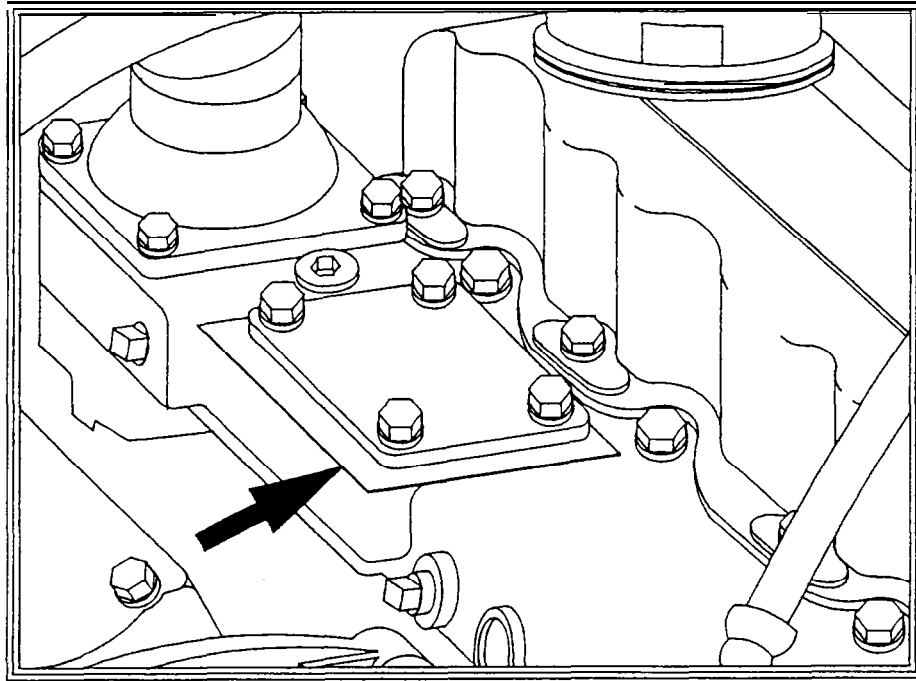


Figure No. 6: Gasket for Alternate Intake

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9. ( ) Figure 7 depicts the upper intake housing and the intake flame arrester and its gasket. Remove the access cover on the side of the upper intake housing and the flapper plate of the intake shutoff valve. Loosen the four (4) bolts and lockwashers securing the upper and lower intake housings together. Remove the intake flame arrester.

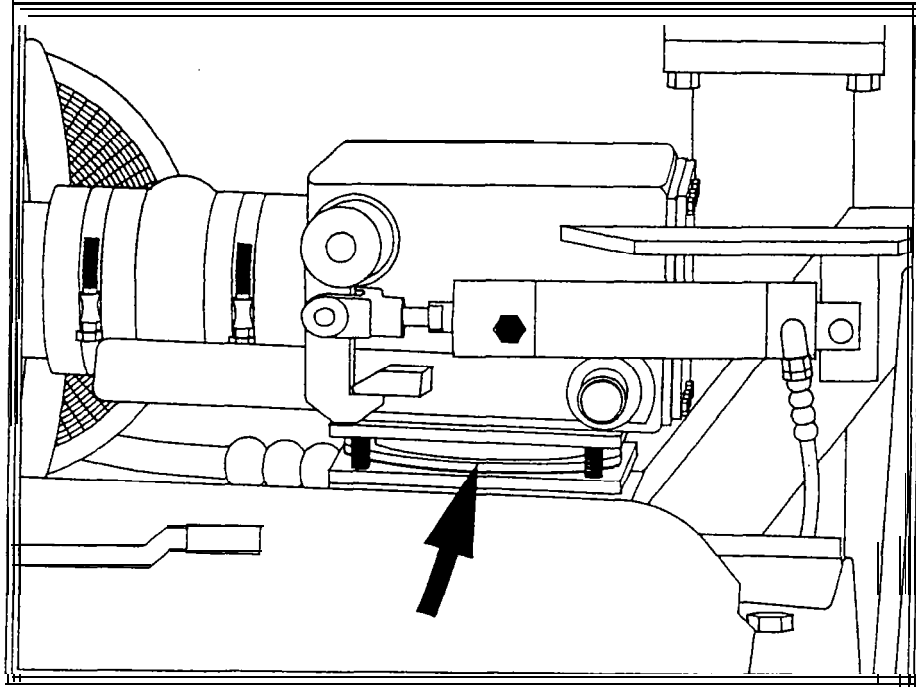


Figure NO. 7: Intake Flame Arrester Location

10. ( ) The intake flame arrester is depicted in Figure 8.  
The arrester core is clean and has no apparent damage.

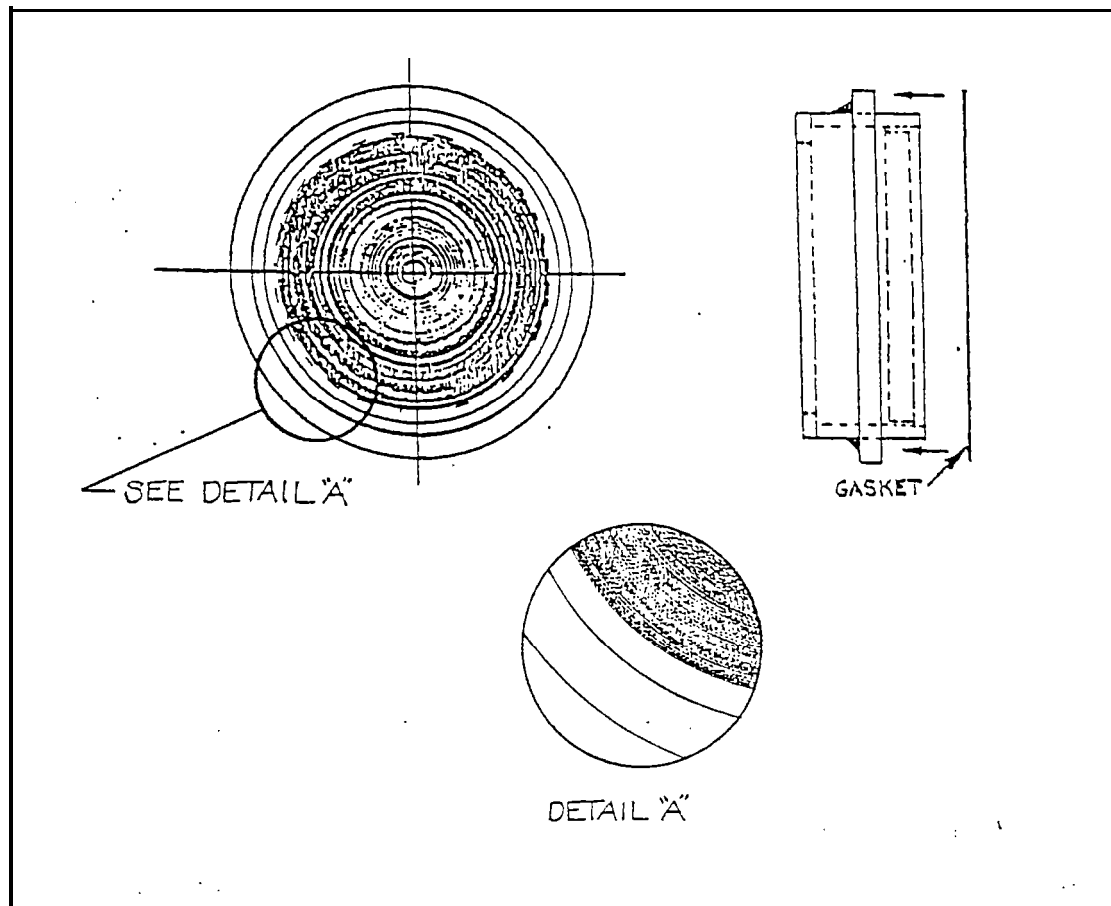


Figure No. 8: Intake Flame arrester and Copper Gasket

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11. ( ) A .018 inch wire gauge cannot pass through the openings of the flame arrester core as shown in Figure 9. The procedure for making this inspection (dated 8/5/85) is attached.

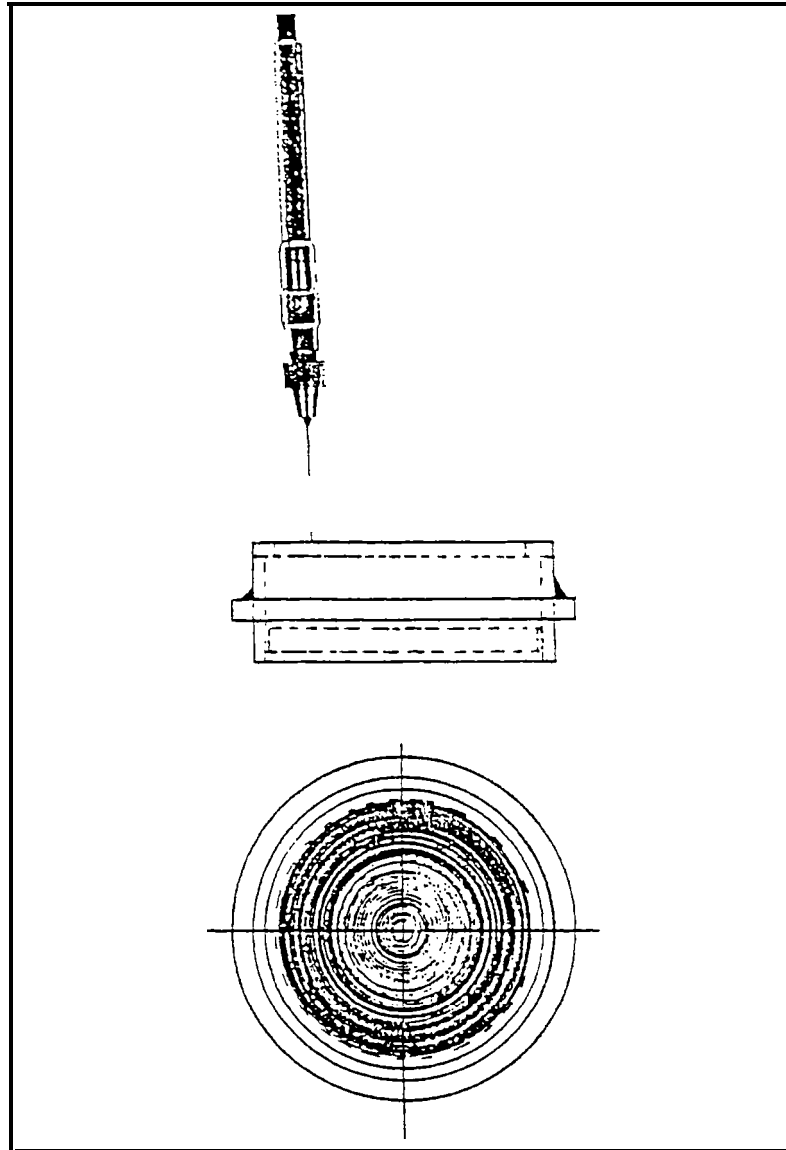


Figure No. 9: Wire Gauge Cannot Pass Through Flame Arrester

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12. ( ) A copper gasket is located between the intake flame arrester and the lower intake housing as shown in Figure 10. The gasket appears to be in good condition.

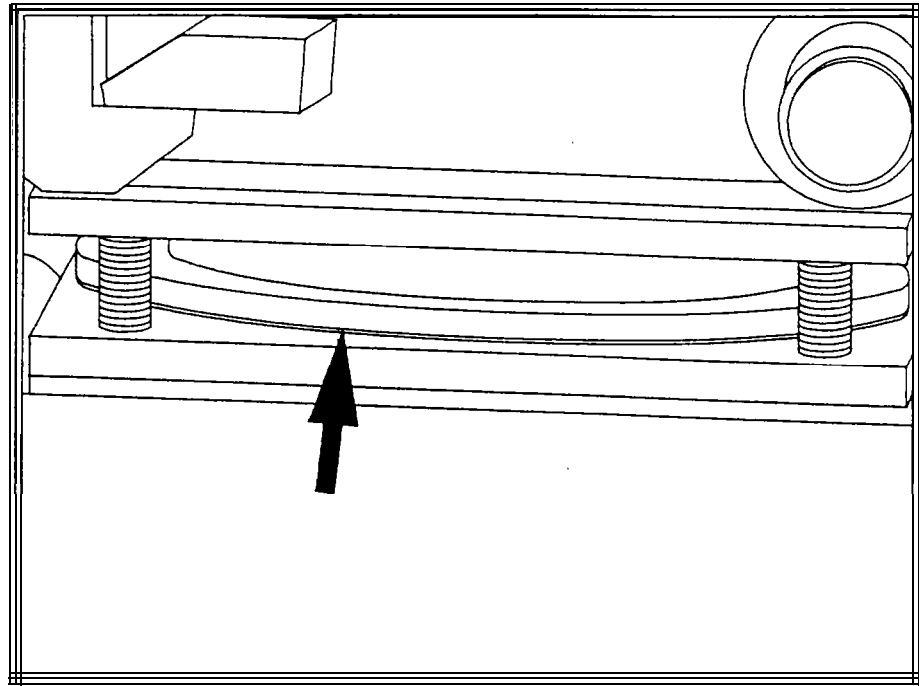


Figure- NO. 10: Flame Arrester Gasket and Location

13. ( ) Reassemble the intake system. The four (4) bolts and lockwashers securing the upper intake housing, flame arrester and gasket to the lower intake housing are in place and tight.

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- (WEEKLY) 14. ( ) A cork gasket is installed between the upper intake housing access cover plate and the upper intake housing as shown in Figure 11. The eight (8) bolts and Lockwashers securing the cover plate are in place and tight.

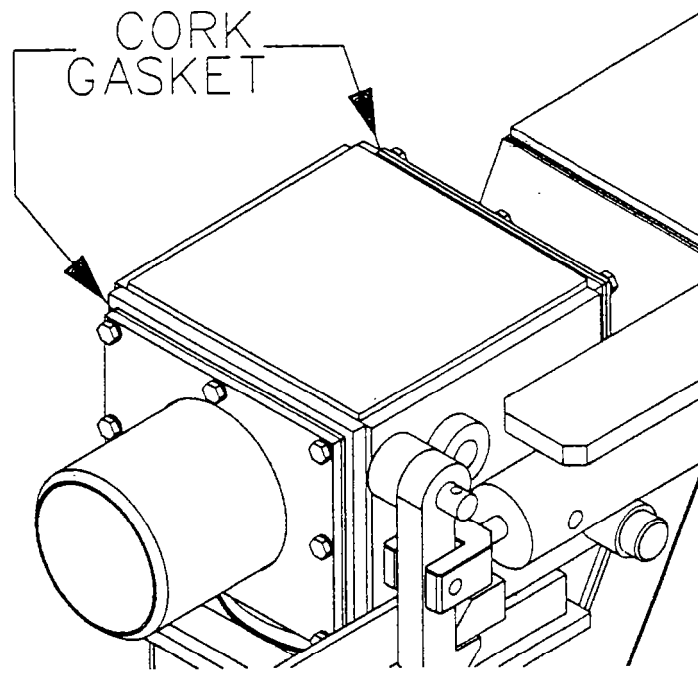


Figure NO. 11: Cork Gasket on Upper Intake Housing

- (WEEKLY) 15. ( ) The clamps which secure the rubber hoses connecting the air cleaner to the upper intake housing are tight.
- (WEEKLY) 16. ( ) The complete intake system shows no evidence of damage. There are no loose connection (s), cracks, or missing port plugs.
- (WEEKLY) 1 DESIGNATES THOSE INSPECTION CHECKS THAT MUST BE PERFORMED DURING THE WEEKLY MAINTENANCE EXAMINATION IN ACCORDANCE WITH 30 CFR, SECTION 75.1914.

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## Exhaust System

The exhaust system of the engine includes a water-cooled exhaust manifold and a water bath exhaust conditioner (scrubber).

- (WEEKLY) 17. 0 Figure 1: is a picture of the water-cooled exhaust manifold. The bolts securing the exhaust manifold to the engine are in place and tight.

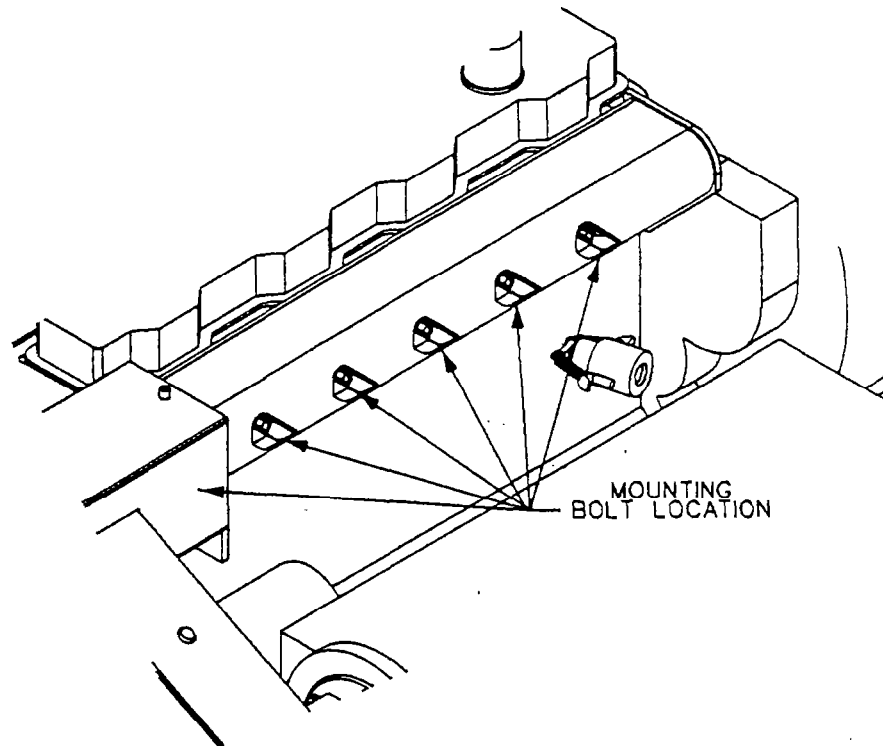


Figure No. 12: Water-Cooled Exhaust Manifold

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- (WEEKLY) 18. ( ) Figure 13 is a picture of the connection between the scrubber and the exhaust manifold outlet flange. The six (6) bolts and lockwashers securing the scrubber to the exhaust manifold outlet flange are in place and tight.

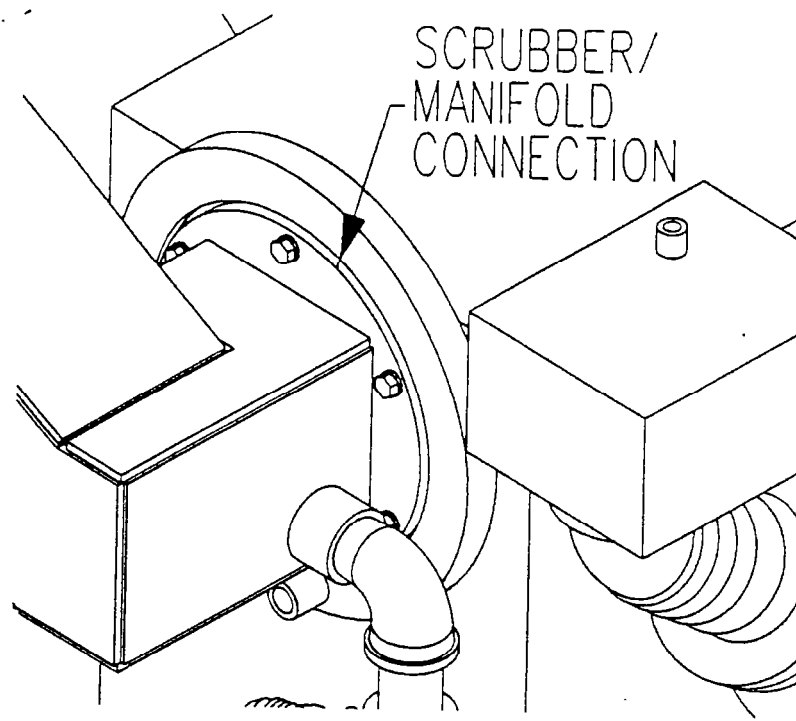


Figure No. 13: Scrubber and Manifold Connection

- (WEEKLY) 19. ( ) The scrubber is in good condition with no open holes or cracks due to corrosion, accidents, missing plugs, etc.

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### System Operation

20. ( ) Connect a manometer or magnehelic to the intake vacuum Port shown in Figure 14 or Figure 15. Run the engine at full throttle with no load. The intake vacuum does not exceed thirty (30) inches of water.

(WEEKLY) 21. ( ) The engine shuts down when the stop button is pushed.

22. ( ) Remove the manometer or magnehelic. The plug sealing the intake vacuum port is securely reinstalled.

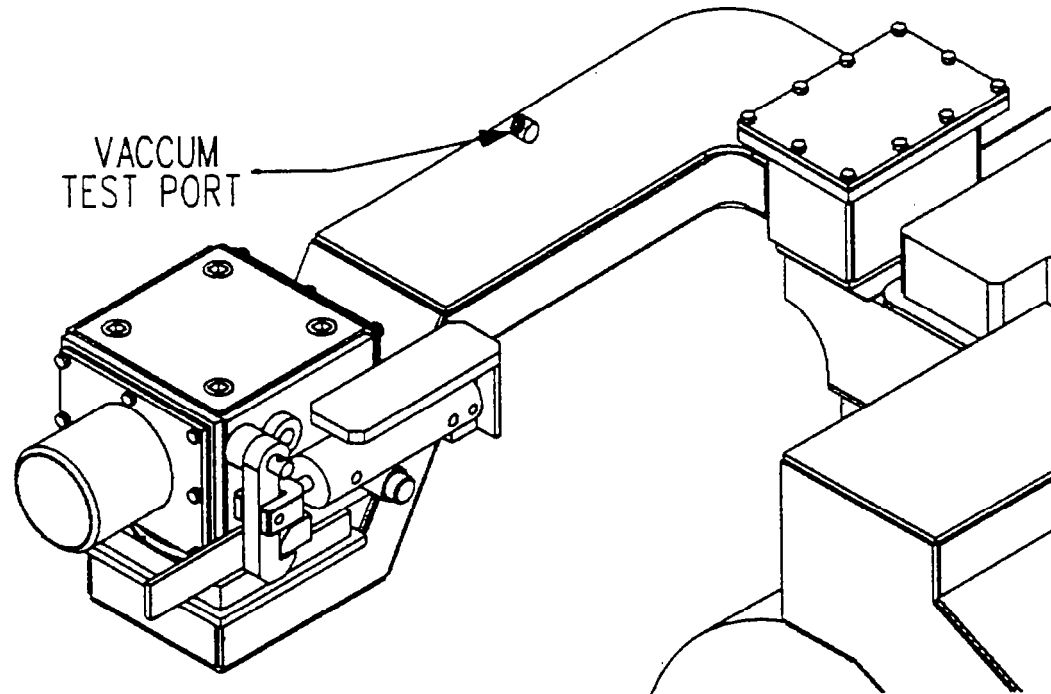


Figure 14: Intake Vacuum Port

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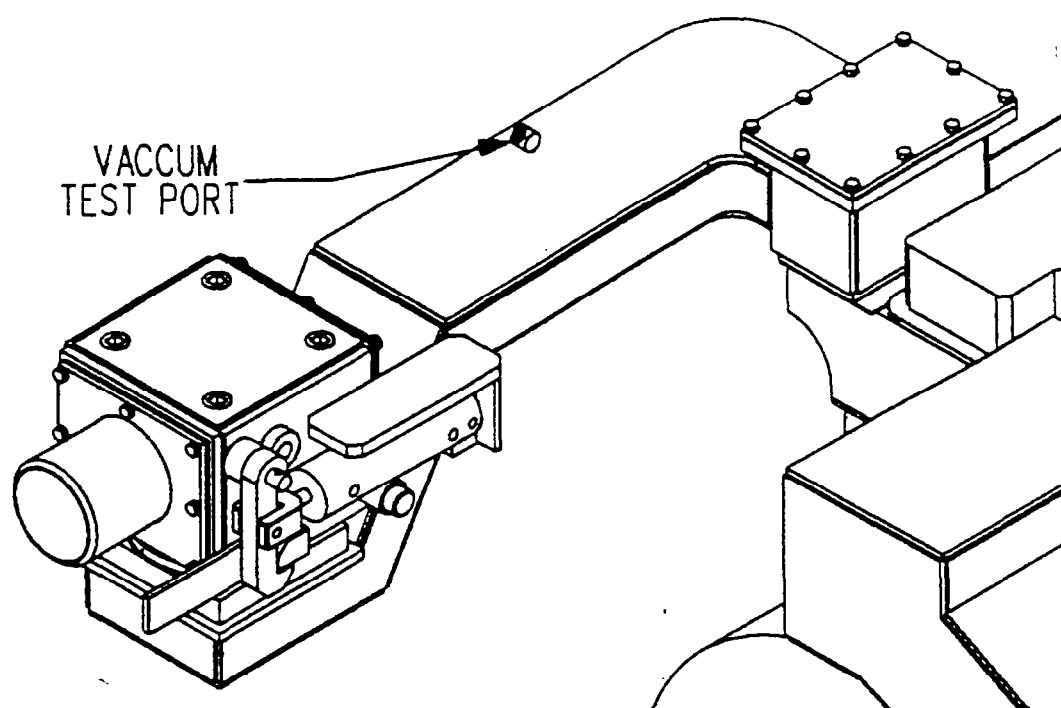


Figure No. 15: Intake Vacuum Port

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23. ( ) Connect a manometer or magnehelic to the test port on the exhaust manifold. Run the engine at full throttle with no load. The exhaust backpressure does not exceed twenty-eight (28) Inches of water. Note port location as shown in Figures 16 and 17.

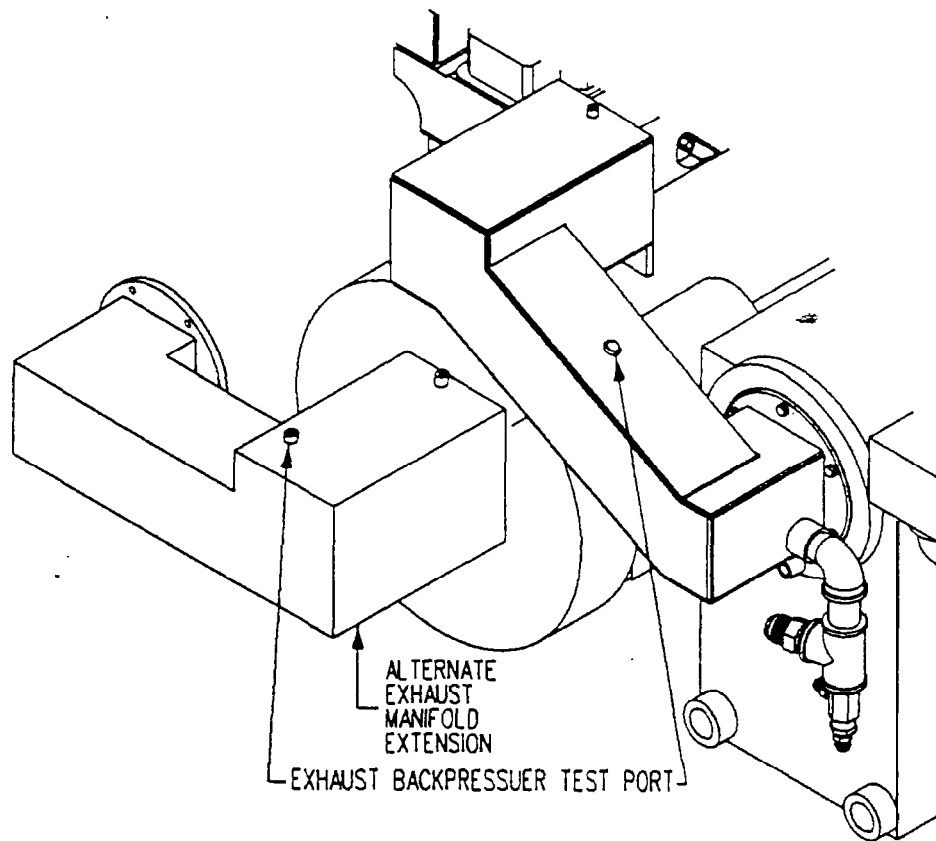


Figure No. 16: Exhaust Backpressure Port

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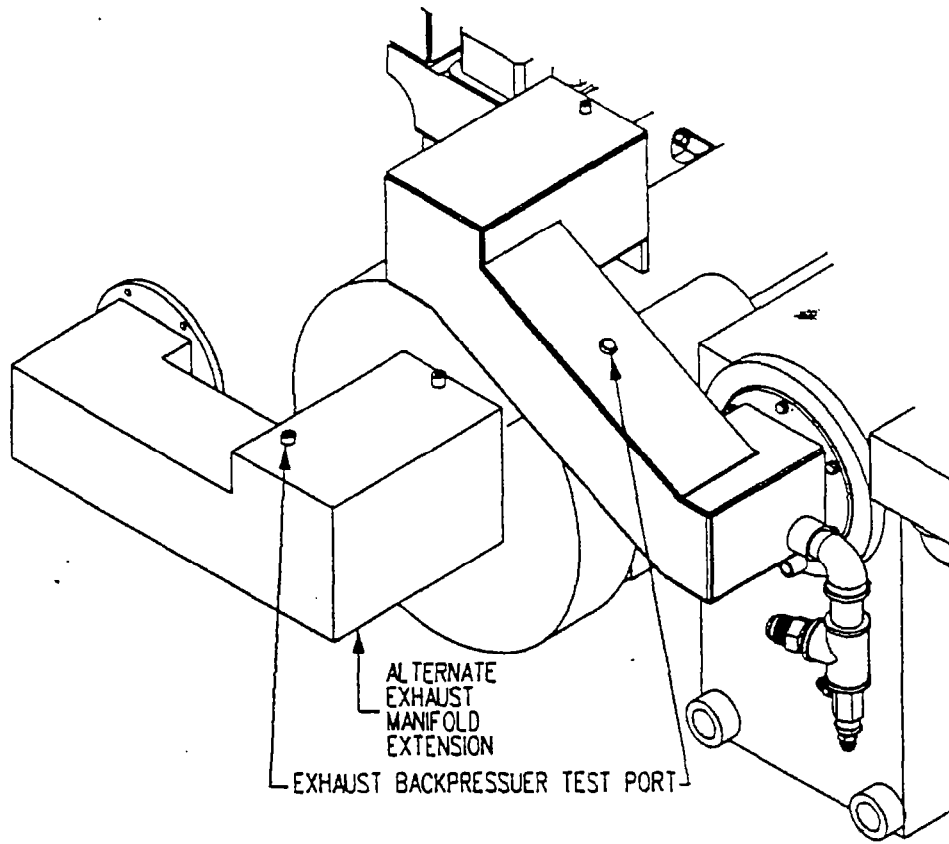


Figure No. 17: Exhaust Backpressure Port

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- (WEEKLY)24. ( ) With the engine running, verify that the safety system air pressure is set at 40 psi and the makeup tank air pressure is set at 5 to 7 psi. The gauges are shown in Figure 18.

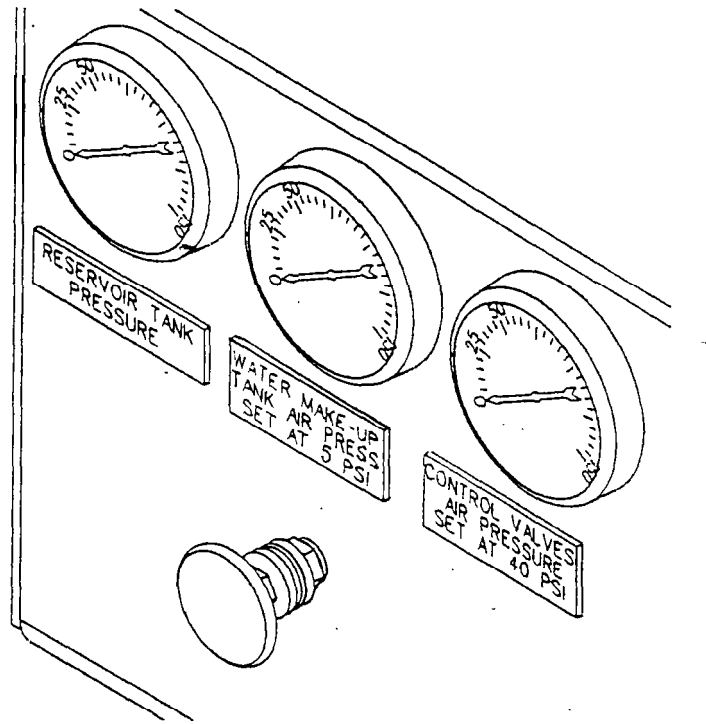


Figure No. 18: Air Pressure Gauges

25. ( ) Shut the engine down and remove the manometer or magnehelic. The plug sealing the exhaust backpressure test port is reinstalled and tight.

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26. ( ) Test the temperature sensor valve that is installed in the water outlet of the exhaust manifold. Figure 19 shows the location of this sensor. One test method is offered for information.

Unscrew the sensor valve from the water outlet and install a pipe plug in its place. Reattach the safety system hoses to the sensor. Start the engine and immerse the end of the temperature sensor valve into a heated and agitated water/antifreeze mixture. The sensor must cause shutdown of the engine before the temperature exceeds 212°F.

27. ( ) Remove the pipe plug from the water outlet of the exhaust manifold and reinstall the temperature sensor valve and its safety system hoses.

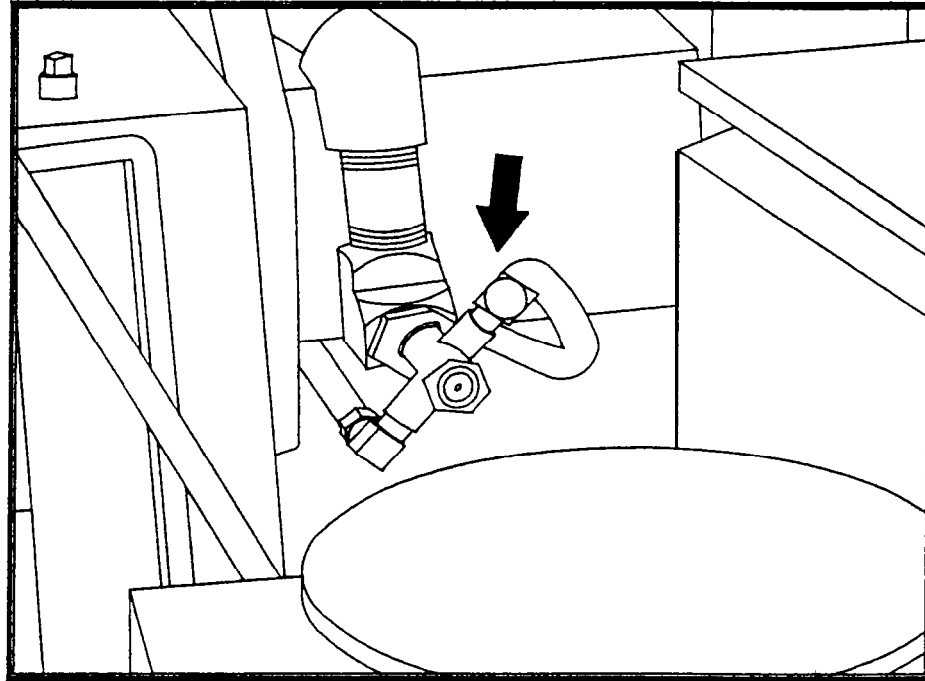


Figure No. 19: Location of High Coolant Temperature Shutdown Sensor

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(Weekly, 28. ( ) Test the high exhaust gas temperature sensor that is installed in the exhaust outlet. Figure 20 shows the location of this sensor. One test method is offered for information:  
 if equipped with an exhaust particulate filter.)  
 Unscrew the sensor valve and install a pipe plug in its place. Reattach the safety system hoses to the sensor. Start the engine and immerse the end of the sensor valve into a heated and agitated water/antifreeze mixture. The sensor must cause the shutdown of the engine before the temperature exceeds 170°F.

(Weekly, 29. ( ) Remove the pipe plug from the exhaust outlet and reinstall the high exhaust gas temperature sensor and its safety system hoses.  
 if equipped with an exhaust particulate filter.)

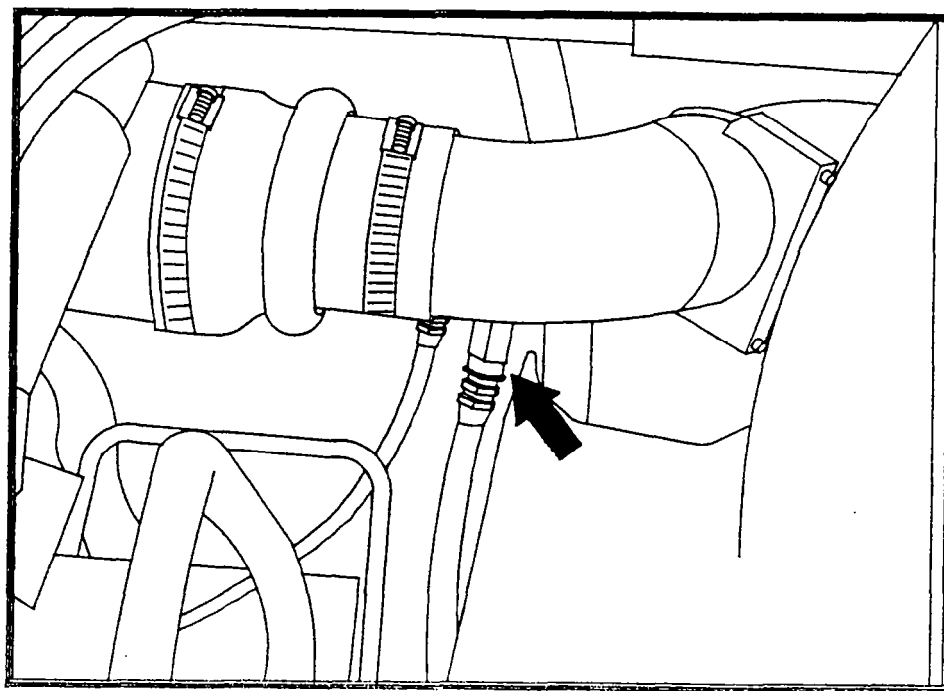


Figure No. 20 Location of High Exhaust Gas Temperature Shutdown Sensor

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(WEEKLY) 30. )

Figure 21 shows the float assembly that maintains the operating water level in the scrubber. Verify that the operating water level is correct:

Start the engine and operate it at medium speed for at least 5 minutes. Shut the engine down and remove the scrubber dipstick port plug. Insert a long rod through this port and check the water-level. The level should be 7-13/16 to 8-13/16 inches.

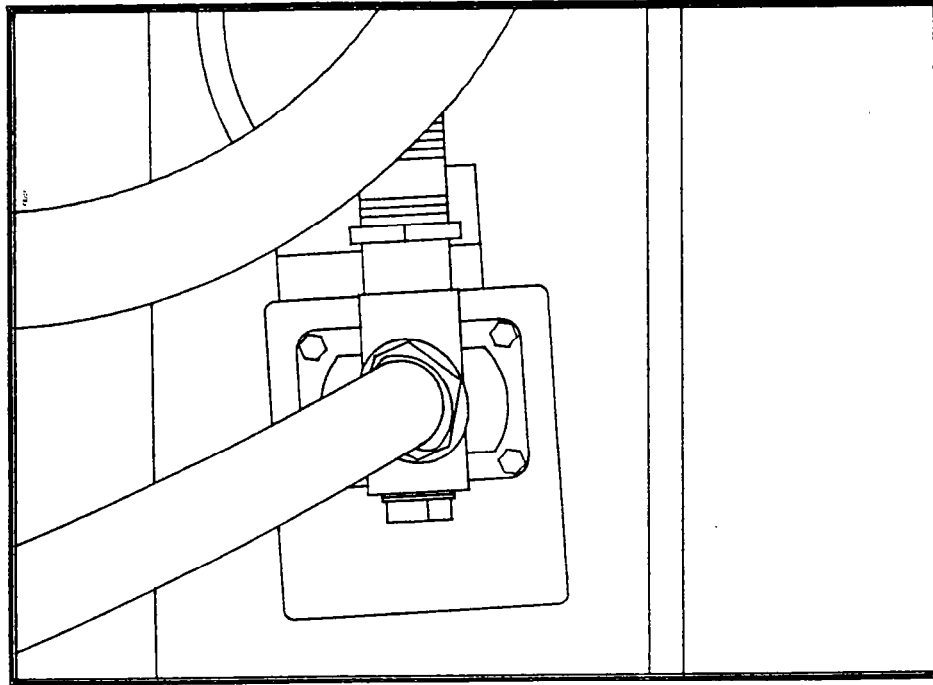


Figure No. 21: Water Level Control Float Assembly

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(WEEKLY) 31. ( ) Figure 22 shows the float assembly that shuts down the engine when the makeup tank runs out of water. Verify that the scrubber low water shutdown level is correct by using the following method :

Start the engine and operate it at medium speed. Disrupt the water supply from the makeup tank. This can be accomplished by closing the air pressure valve to the makeup tank and then slowly removing the makeup tank fill cap.

CAUTION: REMOVE FILL CAP SLOWLY BECAUSE MAKEUP TANK IS UNDER PRESSURE. Run the engine until it automatically shuts down due to low scrubber water. Insert a long rod through the scrubber dipstick port (See Figure 33) and check the water level. The level must be at least 5-13/16 inches.

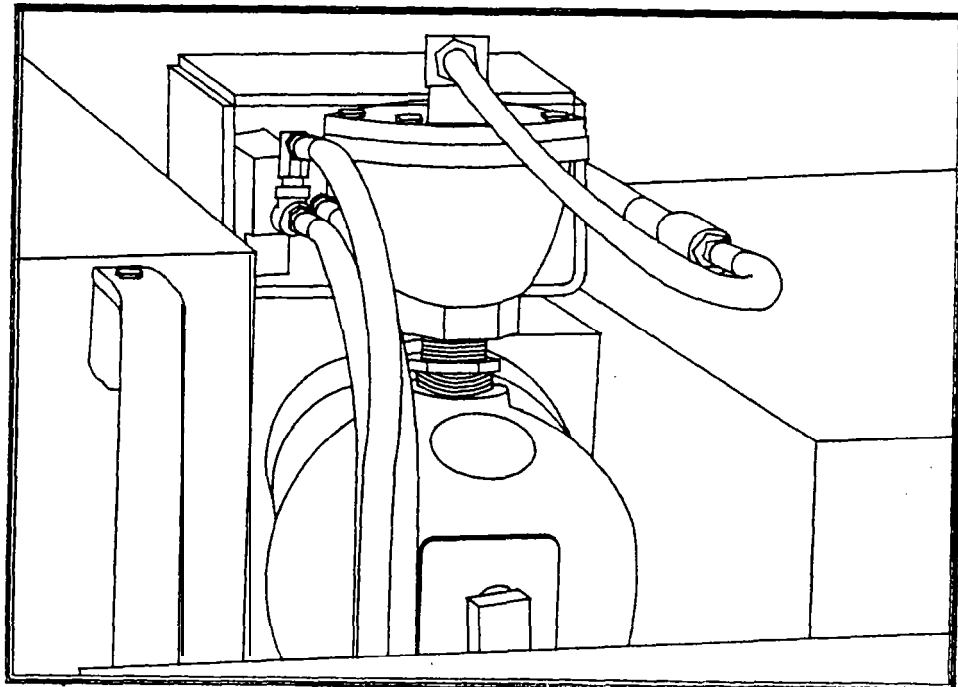


Figure No. 22: Shutdown Float Assembly

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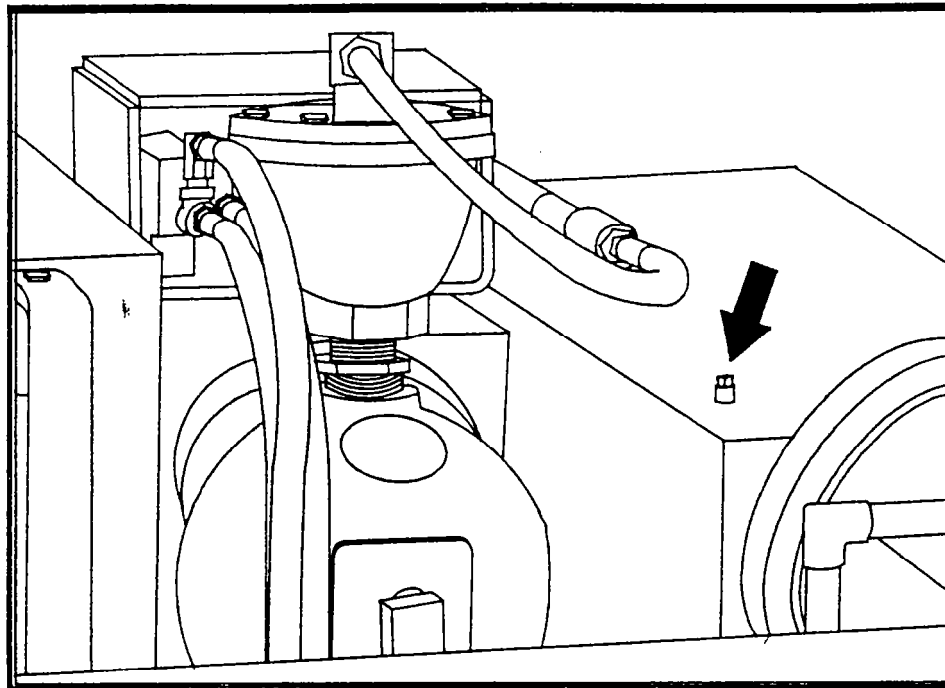


Figure No. 23: Check Port for Scrubber Low Water Shutdown

(WEEKLY) 32. ( ) After the engine has automatically shut down due to low water level, try restarting the engine prior to replenishing the water. The engine may turn over but must not start.

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- (WEEKLY) 33. ( ) The engine will not start at a low water level. This can be tested as follows:  
Completely drain the scrubber by removing one of the drain plugs. Reinstall the drain plug. Allow the scrubber water to replenish itself with water from the makeup tank. Push the oil pressure override button and watch the oil pressure override cylinder assembly (shown in Figure 24). When the override cylinder extends, insert a long rod through the dipstick port and check the water level. This level must be at least 5-13/16 inches.

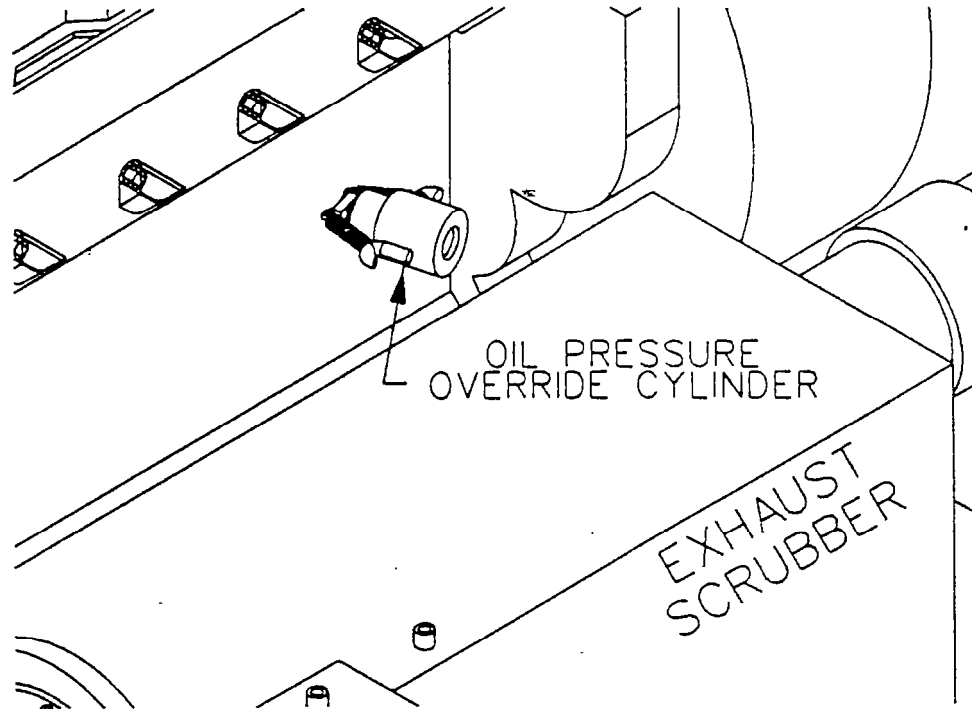


Figure No. 24: Oil Pressure Override Cylinder Assembly

- (WEEKLY) 34. ( ) The oil pressure override cylinder assembly has two (2) springs attached to the cylinder rod yoke assembly as shown in Figure, 24. The springs appear to be in good condition.
- (WEEKLY) 35. ( ) Reinstall the plug into the dipstick port.

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- (WEEKLY) 36. ( ) Start the engine and operate it at high idle and push the emergency stop button. The air shutoff valve closes immediately and shuts down the engine. The location of the emergency stop button on the control panel is depicted in Figure 25.

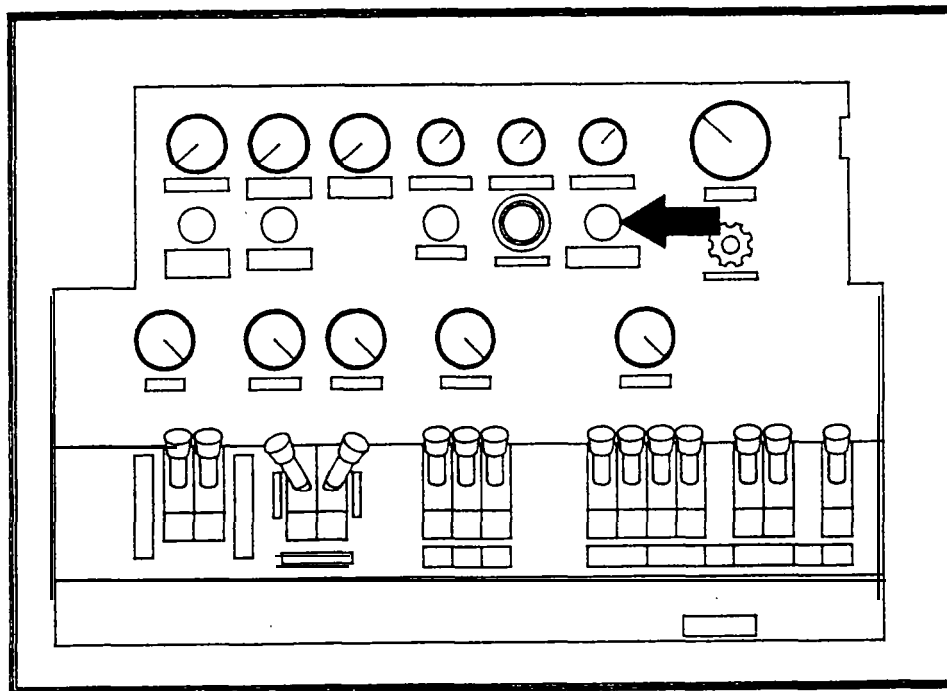


Figure No. 25: Emergency Stop Button

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- (WEEKLY) 37. ) Reset the air intake shutoff valve by placing the handle assembly into the Latch arrangement as shown in Figure 26.

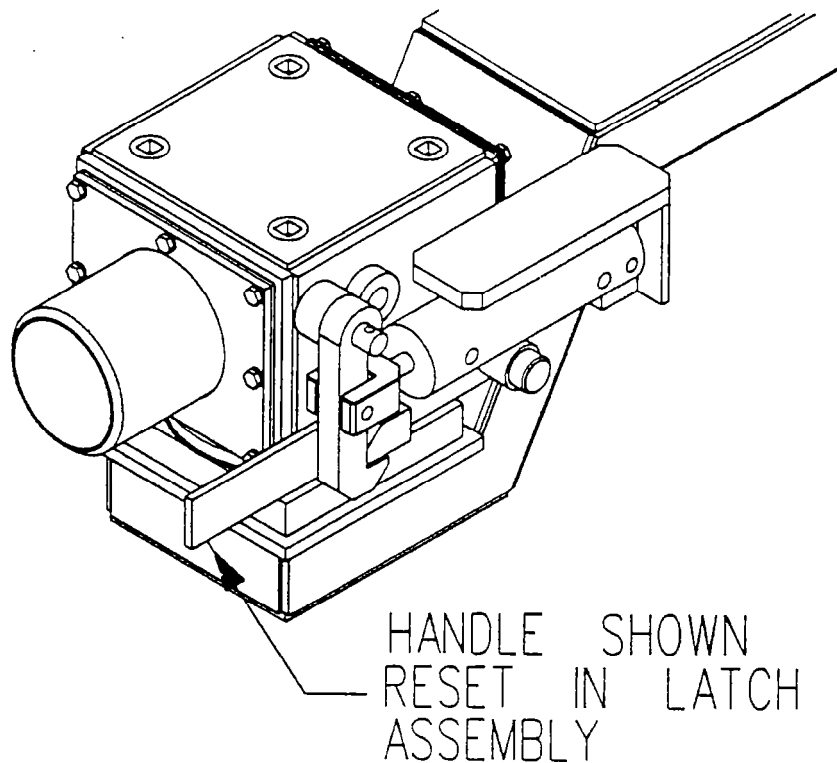


Figure No. 26: Air Shutoff Valve in Open Position

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- (WEEKLY) 38. ( ) Completely drain the air pressure from the safety system by opening the on/off valve on the air receiver that is shown in Figure 27. After the system is completely drained, push the emergency stop button. The air intake shutoff valve must close immediately.

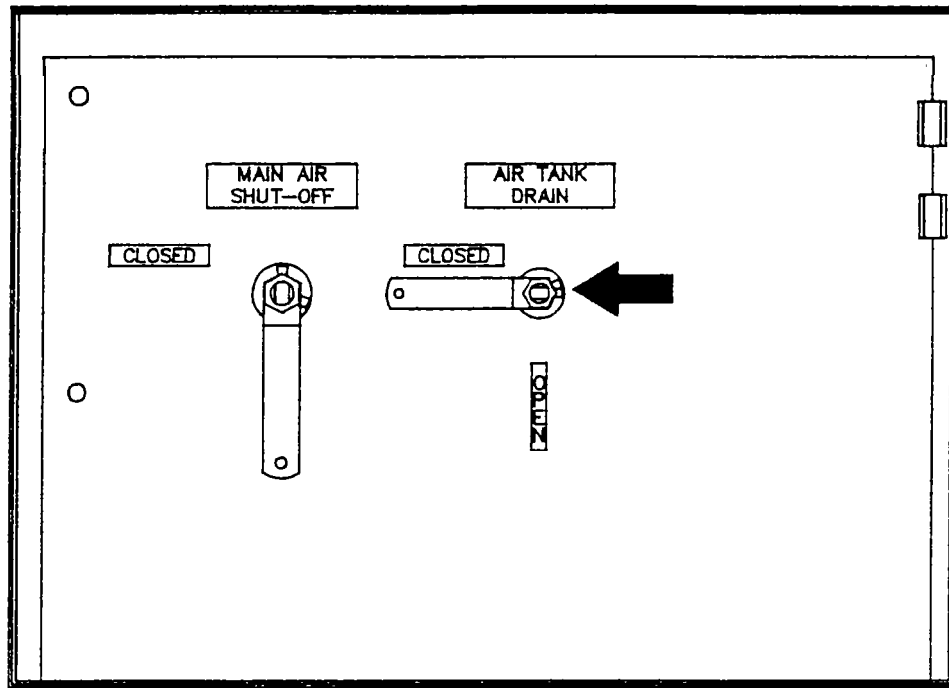


Figure No. 27: ON/OFF Valve of Air Receiver

- (WEEKLY) 39. ( ) Reset the air intake shutoff valve by placing the handle assembly into the latch arrangement as shown in Figure 26.

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EVALUATION PROCEDURES FOR INSPECTING CRIMPED-RIBBON TYPE  
INTAKE FLAME ARRESTERS ON DIESEL-POWERED EQUIPMENT  
(AUGUST 5, 1985)

1. Remove flame arrester assembly from housing.
2. Place on flat surface with a contrasting background under the flame arrester such as, brattice cloth or a clean white cloth.
3. Adequate lighting is required; cap lamp lighting is not sufficient.
4. Visually inspect each side of flame arrester for openings or spaces, obviously greater than the triangular spaces of the core. These kinds of openings may have been caused by prying a screwdriver or other such objects against or through the flame arrester core during manufacturing or in mine maintenance. Flame arrester cores with such damage must not be permitted to be used on permissible equipment.
5. Visually inspect each side of the core for places where the windings of the flame arrester core appear to be separating such that gaps can be seen. If such gaps exist they must be checked as follows:
  - a. The only measuring tool considered acceptable for performing this evaluation is an 0.018 inch calibrated plug gauge. (Sometimes called a wire gauge.) The plug gauge is to be mounted in a gauge holder (Figure 1) weighing 1 to 1.5 ounce and projecting at least one inch out of the end.



FIGURE 1

- b. Grasp the gauge holder lightly between the index finger and thumb. Place the wire tip at the point in question; making sure the plug gauge is vertical. Using only the weight of the gauge and holder see if it will enter the apparent gap. Do not attempt to force or wiggle the gauge through the opening.
    - C. If the plug gauge enters the opening, the flame arrester core must not be used on permissible equipment.
6. Visually inspect the triangles in the flame arrester core (both sides) for triangles that appear to be larger than the rest. If such conditions exist, these openings must be checked as previously described in Section 5 a,b,c.
7. Finally, if the flame arrester core passes all of the above evaluations, a final check should be performed on at least 5 triangles on each side of the core with the procedure described in Section 5 a,b,c. In performing this check, the tip of the plug gauge must be placed against a specific triangular opening. If this special care is not taken, the evaluation will be invalid.